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27JUN02 E728978-1/D01038
P01/7700 0.00-0214817.9

Request for grant of a patent

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The Patent Office
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1. Your reference P303111GB/PMJF

2. Patent application number *(The Patent Office will fill in this part)* 27 JUN 2002 0214817.9

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

ArvinMeritor Light Vehicle Systems (UK) Limited
Fordhouse Lane
Stirchley
Birmingham
West Midlands
B30 3BW
United Kingdom

Patents ADP number *(if you know it)* 8411490001

If the applicant is a corporate body, give the country/state of its incorporation: United Kingdom

4. Title of the invention: Door Latch Mechanism

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

WITHERS & ROGERS
Goldings House
2 Hays Lane
London
SE1 2HW

Patents ADP number *(if you know it)* 1776001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(answer 'Yes' if:*
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b) there is an inventor who is not named as an applicant, or
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Continuation sheets of this form	
Description	8
Claim(s)	3
Abstract	
Drawing (s)	6

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	One
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature [signature] Date 25/6/02

12. Name and daytime telephone number of person to contact in the United Kingdom — Paul Foot — 0121 245 3900

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P303111GB

Door Latch Mechanism

The present invention relates to a door latch mechanism. More particularly, the present invention relates to a door latch mechanism for a vehicle incorporating a body movable in response to vehicle deceleration to cause the latch to be locked.

During an impact with another body, vehicle passenger doors may deform. This deformation may cause components in the linkage from an inside or outside door handle to change their relative position. This potentially results in an unwanted unlatching of the latch. In such a crash or impact situation, unlatching of vehicle passenger doors is undesirable because the latched doors provide a large proportion of the structural integrity of the vehicle, whereas unlatched doors do not. Additionally, the unlatching of a door during an impact increases the risk of vehicle occupants being thrown from the vehicle leading to an increased risk of injury.

The present invention seeks to overcome, or at least mitigate the problems of the prior art.

Accordingly, one aspect of the present invention provides a door latch mechanism for a vehicle comprising a release lever operable by a door handle, and a transmission linkage arranged in normal operation to transmit unlatching movement from the release lever to release a latch bolt of the latch, wherein, in the event that the vehicle undergoes deceleration above a predetermined level, the inertia of a body in the latch mechanism causes a break or block to be created in the transmission linkage.

Embodiments of the present invention will now be described, by way of example only, with reference to the drawings in which:

FIGURE 1 is a schematic view of a latch mechanism according to the present invention incorporating a transmission linkage shown in a rest position;

FIGURE 2 shows the transmission linkage of Figure 1 in a locked position;

FIGURE 3 shows the linkage of Figure 1 in a pawl lifted condition;

FIGURE 4 shows the linkage of Figure 1 in a lever return position;

FIGURE 5 shows the linkage of Figure 1 in a full travel position;

FIGURE 6 is a schematic view of a latch mechanism according to another embodiment of the present invention incorporating a transmission linkage shown in a rest position;

FIGURE 7 shows the linkage of Figure 6 in a locked position;

FIGURE 8 shows the linkage of Figure 6 in a resetting position;

FIGURE 9 shows the linkage of Figure 6 in a full travel position;

FIGURE 10 is a schematic view of a latch mechanism according to another embodiment of the present invention incorporating a linkage, the linkage being in a rest position; and

FIGURE 11 shows the linkage of Figure 10 in a locked condition.

Referring to Figure 1, a latch mechanism indicated generally at 10 comprises a chassis 12 upon which a number of latch components are mounted. The components comprise a release lever 14 pivotally mounted to the chassis 12 by pin 16 at one end and further having a slotted aperture 18 at its other end for connection to an outside door handle illustrated schematically at 20. A limb 22 extends from one side of release lever 14 and has pivotally mounted thereon a catch 24 having a tooth 26. The catch 24 is pivotally mounted about pin 28 and is biased in a clockwise direction as shown in Figure 1. A ramp surface 30 is secured to tooth 26 and projects into the paper when viewed in Figure 1.

A pawl 32 is pivotally mounted to release lever 14 via pin 34 positioned intermediate pin 16 and aperture 18. The pawl 32 is biased in an anti-clockwise direction. The pawl comprises a pawl tooth 36 arranged to engage tooth 26 of catch 24 via an end end surface 38 of the pawl and an inner surface 40 of catch tooth 26. Pawl tooth 36 further comprises an inner surface 42 and catch tooth 26 further comprises an end surface 44.

A fixed projection 46 extends from the chassis 12 and is positioned so as to engage ramp 30 during pivoting motion of the release lever 14, as will be discussed in further detail below.

A transmission lever 48 is further pivotally mounted to pin 34 on release lever 14. The transmission lever is rotationally fast with pawl 32 and is therefore also biased in an anti-clockwise direction by biasing means such as tension spring 50. An abutment surface 52 is provided at the end of lever 48 remote from pin 34 such that in normal operation the abutment surface may contact a corresponding abutment surface 54 of an actuating lever 56.

A projection 58 is provided on one face of transmission lever and fits in a slot or recess 16 provided in chassis 12. In normal operation, projection 58 may slide along a linear slot portion 60a, arranged to extend substantially parallel to the longitudinal axis of transmission lever 48. The projection is, of course, biased towards the upper surface of slot portion 60a by spring 50. However, projection 58 may also move along arcuate slot portion 60b as transmission lever pivots about pin 34 to come to rest in the position shown in Figure 2. Thereafter, projection 58 may move to the positions shown in Figures 4 and 5 so as to come to rest along the abutment surface 62 which extends substantially parallel to slot portion 60a. It should be noted that with pin 58 at rest along abutment surface 62, abutment surface 52 of the transmission lever 48 cannot contact abutment surface 54 of actuating lever 56.

The latch mechanism 10 further comprises a latch bolt (not shown) of known kind, such as a rotating claw, capable of releasably retaining a complementary striker (not shown) by virtue of a pawl (not shown) connected to the actuating lever 56, as is well known.

Under normal operating conditions starting with the latch in a latched, unlocked condition, the latch operates as follows:

The vehicle user pulls on outside door handle 20 causing release lever 14 to pivot in an anti-clockwise direction against its biasing force. In turn, this causes transmission lever 48 to move from left to right, with pin 58 sliding in slot portion 60a such that abutment surface 52 contacts abutment surface 54 of the actuating lever 56, displacing the actuating lever and causing the latch to unlatch. When the outside door handle 20 is released, the transmission linkage returns to the rest position shown in Figure 1, thereby enabling the latch mechanism 10 to re-latch.

Turning to Figure 2, with the vehicle to which latch mechanism 10 is fitted moving, an impact has occurred that is sufficient to cause the inertia of transmission lever 48 to overcome the resilience of spring 50 and pivot in direction X to bring projection 58 into the position shown in Figure 2. Since lever 48 is rotationally fast with pawl 32, pawl 32 also pivots in a clockwise direction. This results in surface 38 sliding out of contact with surface 40, thereby allowing catch 24 to rotate clockwise. Surface 44 of the catch tooth 26 thus comes into contact with surface 42 of the pawl tooth and retains lever 48 in the position shown in Figure 2 against the biasing force of spring 50. In a typical impact, this movement may occur in 8 to 12 milliseconds and prevents abutment surface 52 contacting abutment surface 54 of actuating lever 56 due to unwanted deformation of the door.

After the impact occurs, a single pull on outside door handle 20 causes release lever 14 and catch 24 to pivot about pin 16. This pivoting motion causes fixed projection 46 to contact ramp 50, thus also forcing catch 24 to rotate anticlockwise about pin 28 relative to release lever 14. It has to be seen from Figures 2 and 4, this causes surface 42 to no longer be in contact with surface 44 of the catch 24, thereby enabling projection 58 to

move upwardly in a direction Y as it is also being moved to the right under the influence of a pivoting movement of lever 14 about pin 16. This movement continues until projection 58 comes to rest on surface 62 as shown in Figure 4.

If the outside door handle 20 is pulled to its full extent of travel projection 58 will reach the position on surface 62 shown in Figure 5. However, once outside door handle 20 is released, the biasing of release lever 14 and transmission lever 48 will cause projection 58 to slide to the left along surface 62 before moving upwards to return to the rest position shown in Figure 1.

A subsequent pull on the outside door handle then enables the latch mechanism 10 to be released in the normal way, with abutment surface 52 contacting abutment surface 56. This resetting feature of the transmission linkage enables the latch to be continue to be used in the normal way after an impact. In particular, it enables the door to be opened to enable emergency personnel to enter the vehicle in the event that the vehicle occupants are injured in the impact (assuming that this is not prevented by excessive deformation of the door to which the latch is fitted).

Turning to Figures 6 to 9, which illustrate a second embodiment of the present invention, like parts have wherever possible been designated by like numerals with the addition of the prefix "1". Only differences between the latch of the second embodiment with respect of the latch of the first are discussed in further detail below.

It can be seen from Figure 6 that the pawl and catch arrangement of the first embodiment has been dispensed with. In contrast with the transmission lever 48 of the first embodiment, transmission lever 148 is biased in a clockwise direction by a tension spring 150. Slot 160 is substantially triangular in shape. In normal operation, projection 158 is maintained in the upper region 160a of the slot 160 by an inertia body 170 pivotally about pin 172.

The inertia body 170 is resiliently biased in an anti-clockwise direction and is shown in its rest position in Figure 6. An upper surface 176 of the body 170 defines, together

with the upper surface of slot 160 what is effectively an elongate slot portion 160a equivalent to slot portion 60a of the first embodiment. However, due to the clockwise biasing of transmission lever 148, projection 158 tends to contact surface 176 of the inertia body 170 during movement along slot portion 160a.

Inertia body 170 further comprises an inertia mass portion 174 remote from pin 172.

In normal operation, a vehicle user pulls on outside door handle 120 causing transmission lever 148 to move substantially linearly towards actuating lever 156 whilst being guided by the movement of pin 158 in a slot portion 160a. Abutment surface 152 contacts abutment surface 154 to actuate the actuating lever 156, thereby causing the latch to be released.

If the vehicle is involved in an impact resulting in deceleration above a predetermined value, inertia body 170 is caused to pivot about pin 172 in a clockwise direction. This occurs due to the tendency of the inertia mass portion 174 to continue moving, whilst the rest of the vehicle decelerates. In the rest position the spatial relationship between surface 176, projection 158, pin 172 and the slot 160 is such that the inertia mass may rotate without fouling on the projection 158. Once the inertia mass 170 has rotated, the transmission lever rotates in a clockwise direction X under the influence of spring 150 to come to rest in the position shown in Figure 7. Once the deceleration has ceased, inertia mass 170 rotates anti-clockwise to return to its rest position under the influence of its biasing.

When the outside door handle 120 is then pulled, projection 158 follows surface 178 of slot 160 in a direction Y as can be seen in Figure 8. This results in abutment surface 152 missing abutment surface 154. This movement also causes the inertia body 170 to rotate in a clockwise direction allowing projection 158 to pass, before returning to its rest position as shown in Figure 9. Thus, once the handle 120 is released, projection 158 follows surface 176 and returns to the rest position shown in Figure 6. From this position, a further pull on outside door handle 120 will cause the transmission linkage to operate as normal.

Figures 10 and 11 illustrates a third embodiment of the present invention in which like parts have again been designated by like numerals, but with the addition of the prefix "2". Again, only the differences between this embodiment and the first two embodiments are discussed in detail.

It can be seen that in this embodiment, the slots 60 and 160 of the first two embodiments have been dispensed with. Instead, projection 258 rests in normal use in a notch 280 provided in inertia body 270. When a user pulls on outside door handle 220, transmission lever 248 moves from left to right to contact actuating lever 256, whilst projection 258 is retained within notch 280. This means that inertia body 270 rotates during this movement against the biasing force of torsion spring 284.

In an impact, the inertia body 270 is caused to rotate in a clockwise direction in a similar manner to the body 170 of second embodiment. This causes projection 258 to leave notch 280 and slide in a direction of X_2 to attain the position shown in Figure 11. Once the deceleration due to the impact has ceased, the projection is maintained in this position due to an equilibrium of the anti-clockwise biasing force acting on release lever 214, clockwise biasing force acting on the transmission lever 248 due to spring 250, the anti-clockwise biasing force acting on the inertia body 274 due to torsion spring 284, and the frictional resistance between projection 258 and surface 282 of body 270.

A subsequent pull on outside door handle 220 causes inertia member 270 to rotate in a clockwise direction until the frictional resistance between projection 148 and surface 282 and the biasing force of spring 250 is overcome, so that the projection slides back into notch 280. However, during this sliding motion and rotation of the inertia body 270, abutment surface 252 misses abutment surface 254. Only once the outside door handle is released, to return transmission linkage back to the rest position shown in Figure 10 will a further pull on outside door handle lead to the unlatching of the latch 210.

It should be appreciated that the various orientations and directions used to describe the position of various components and the movement of components are for ease of reference only. In practice the latch may be installed in a number of different positions provided the orientation is such that deceleration will result in the latch operating as described above. As such, the terms used should not be construed as limiting.

It will be appreciated that numerous changes may be made within the scope of the present invention. For example, the person skilled in the art will appreciate that numerous alternative configurations of components may be used to achieve a break in the transmission path which is subsequently resettable. Additionally, components may be provided to block the transmission path, rather than provide a break. Furthermore, a similar arrangement may be used to provide such a block or break in the transmission path from the inside door handle to the latch bolt, although in normal circumstances it is less likely to for deformations of the door in an impact to cause unlatching by virtue of the movement of the inside door handle relative to the latch mechanism. In certain circumstances it may not be necessary for the mechanism to be resettable.

Claims

1. A door latch mechanism for a vehicle comprising a release lever operable by a door handle, and a transmission linkage arranged in normal operation to transmit unlatching movement from the release lever to release a latch bolt of the latch, wherein, in the event that the vehicle undergoes deceleration above a predetermined level, the inertia of a body in the latch mechanism causes a break or block to be created in the transmission linkage.

2. A door latch according to claim 1 wherein the break or block is subsequently removable.

3. A door latch mechanism according to claim 2 wherein the block or break is removable by actuation of the release lever.

4. A door latch mechanism according to any preceding claim wherein the linkage comprises a transmission lever.

5. A door latch mechanism according to claim 4 wherein the transmission lever is pivotally mounted to the release lever.

6. A door latch mechanism according to any preceding claim wherein the block or break is a break.

7. A door latch mechanism according to claim 6 when dependent upon claim 5 wherein the break may be created by pivoting of the transmission lever.

8. A door latch mechanism according to claims 5 to 7 wherein the transmission lever is the body.

9. A door latch mechanism according to claim 8 wherein a pawl and catch arrangement is capable of maintaining the break.

10. A door latch mechanism according to claim 9 wherein the pawl is releasable by an actuation of the release lever.

11. A door latch mechanism according to claim 10 wherein a guide arrangement is provided to control the return of the transmission lever to the normal operating position thereof.

12. A door latch mechanism according to claims 1 to 7 wherein an inertia member is the body.

13. A door latch mechanism according to claim 12 wherein the inertia member is pivotable to cause the creation of the block or break.

14. A door latch mechanism according to claim 13 wherein the inertia member is pivotable to enable the transmission lever to return to its normal operating position.

15. A door latch mechanism according to claim 14 wherein the linkage is so arranged that actuation of the release lever enables the transmission lever to return to its normal operating position in conjunction with the inertia member.

16. A door latch mechanism according to claim 14 or claim 15 wherein the inertia member is also pivotable during normal operation of the latch.

17. A door latch mechanism according to claim 16 wherein a notch is provided in the inertia member for the transmission lever to engage during normal operation of the latch.

18. A door or door module incorporating a latch mechanism according to any preceding claim.

19. A vehicle incorporating a latch mechanism according to any one of the claims 1 to 17.

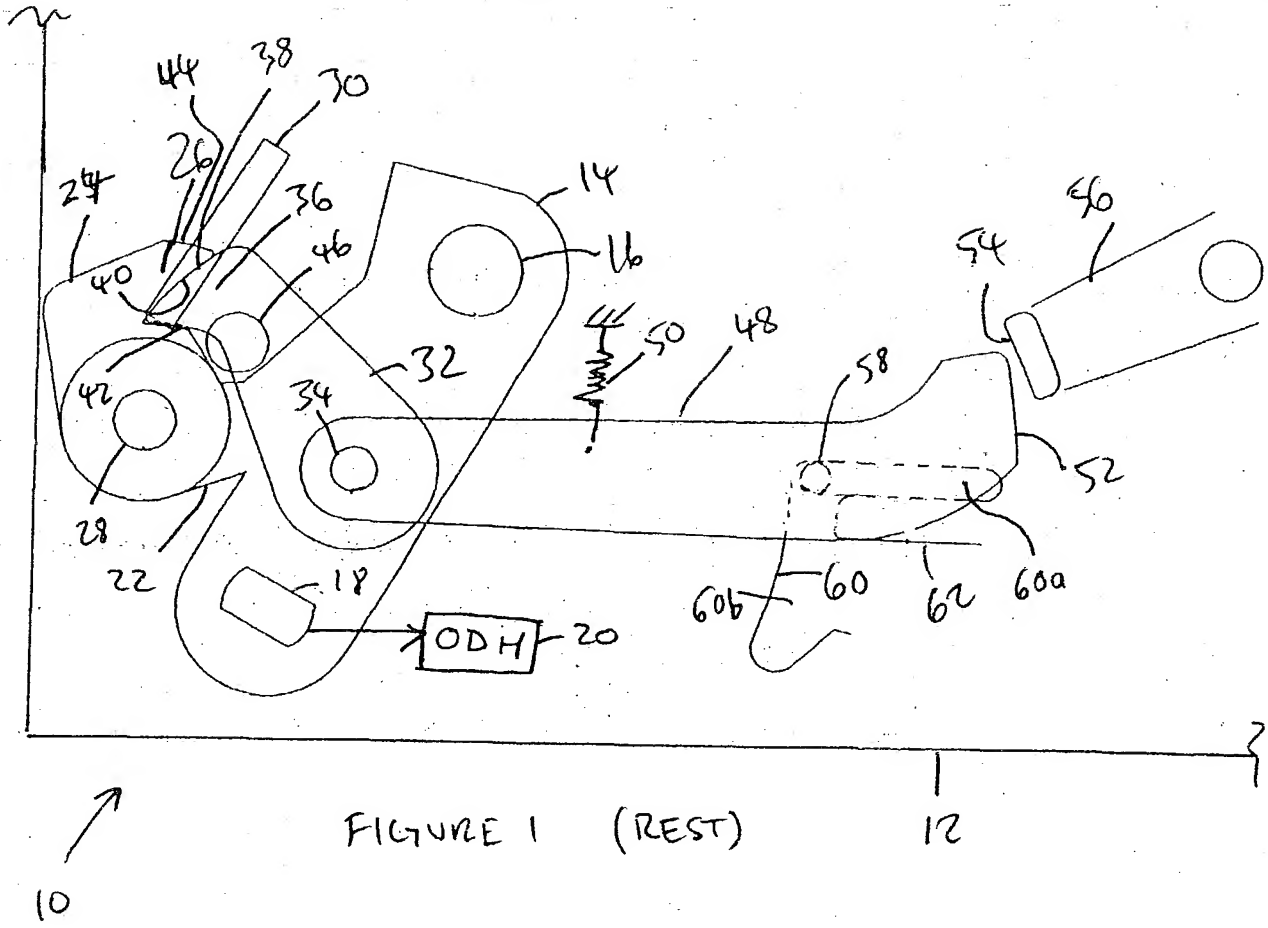

FIGURE 1 (REST)

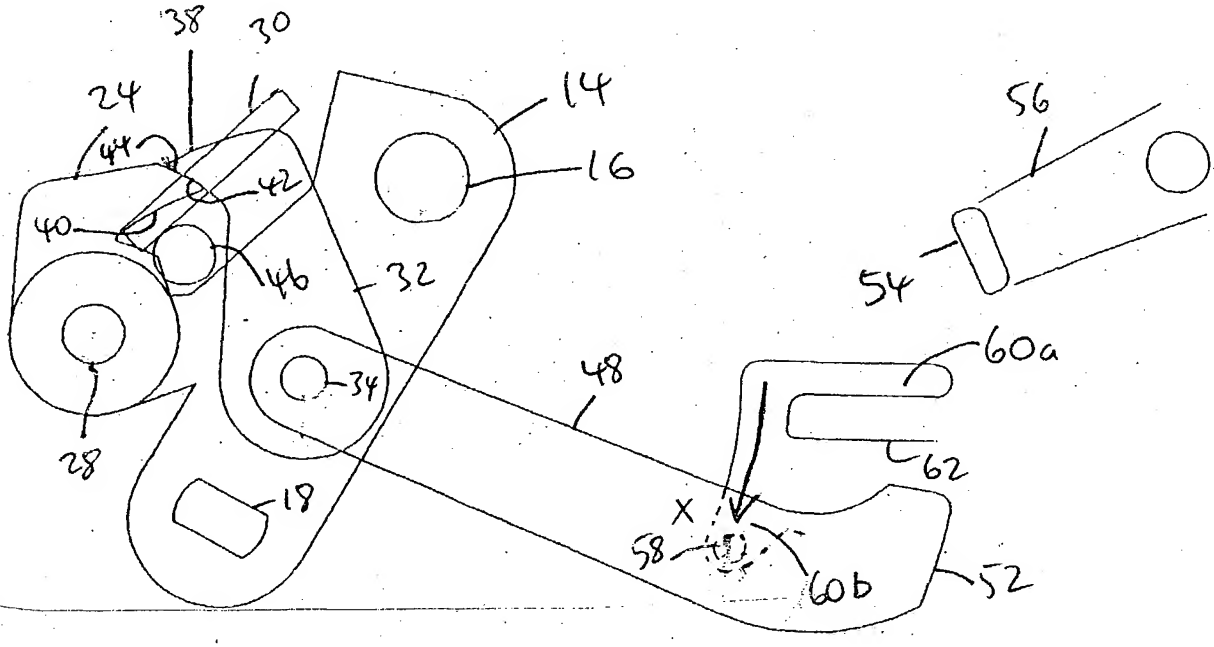

FIGURE 2 (LOCKED)

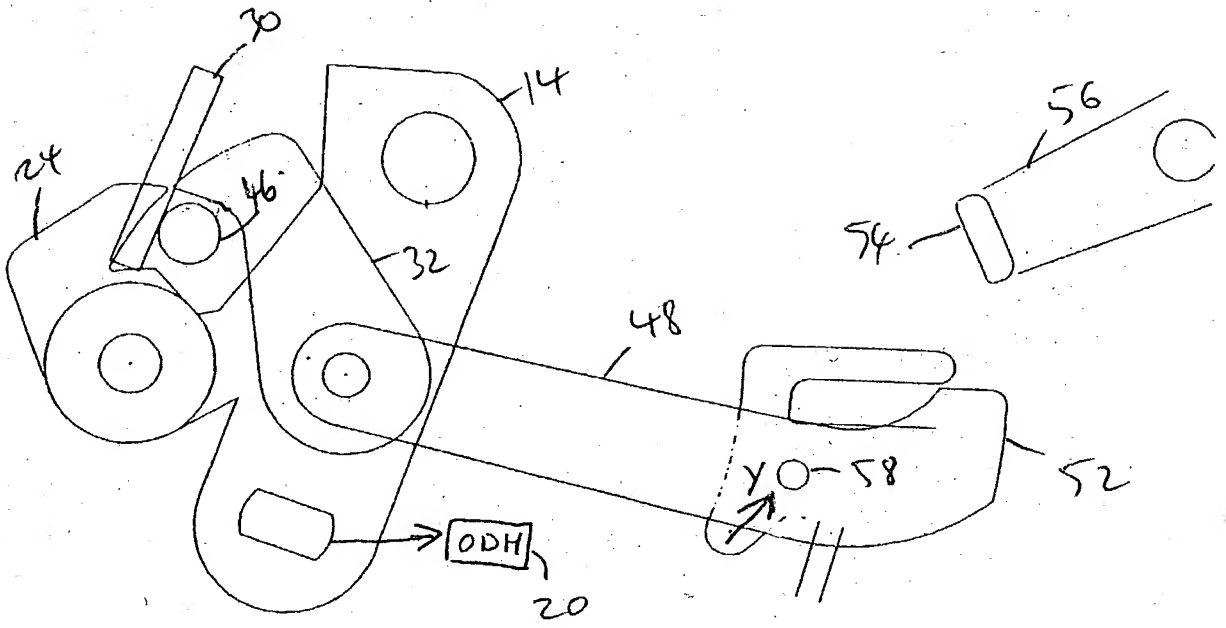

FIGURE 3 (PAWL LIFTED)

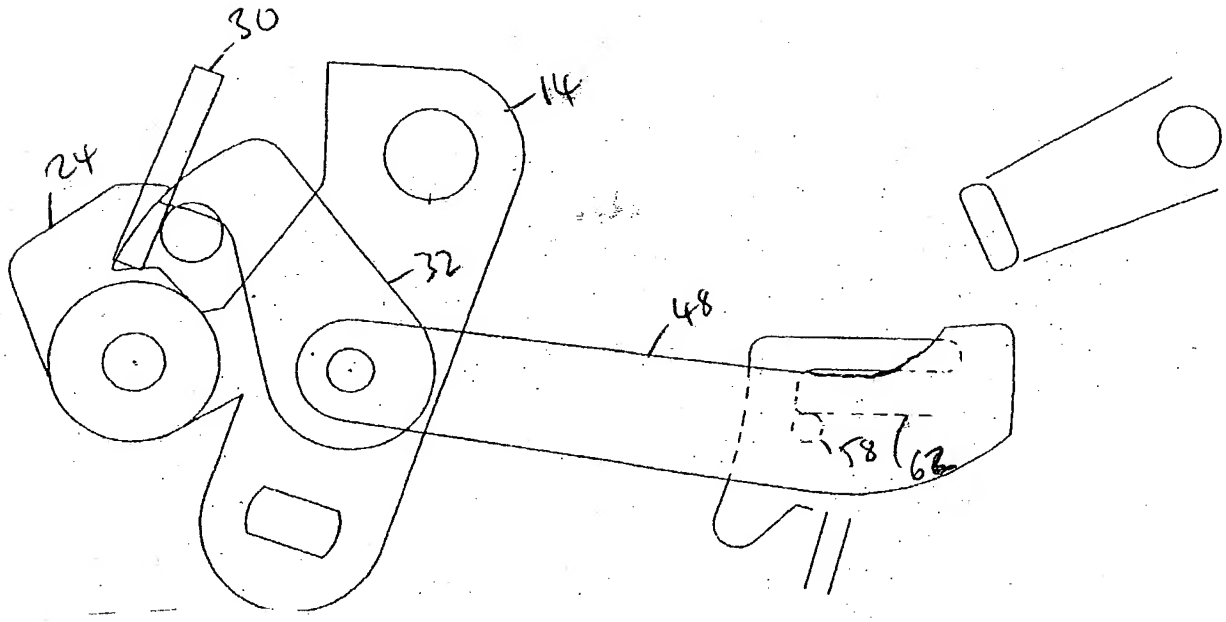

FIGURE 4 (LEVER RETURNS)

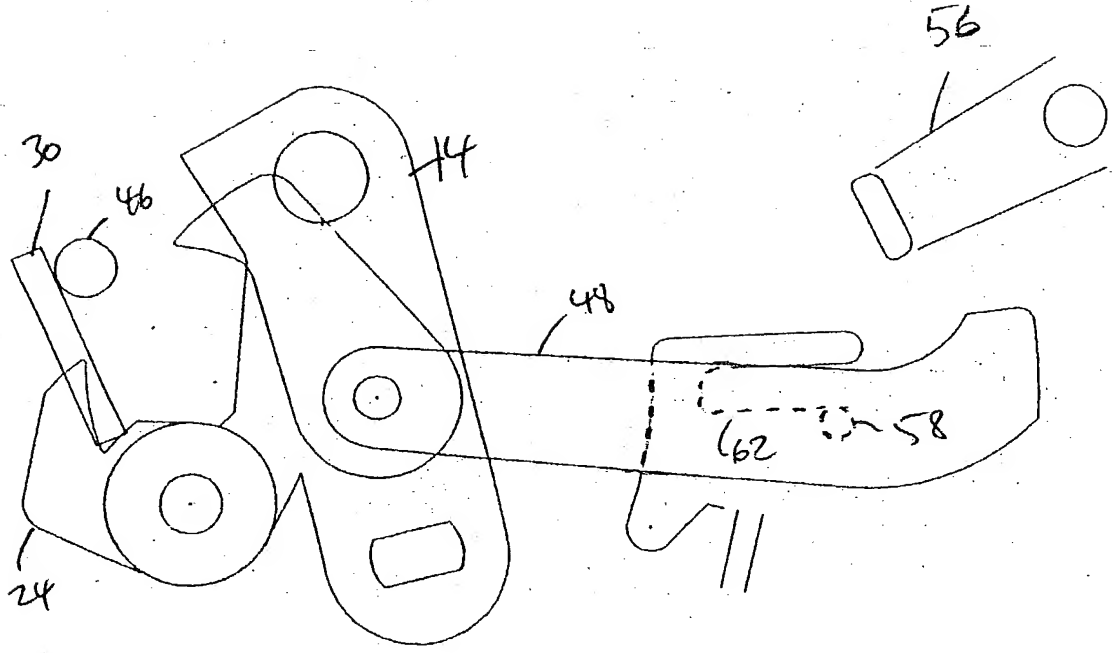

FIGURE 5 (FULL TRAVEL)

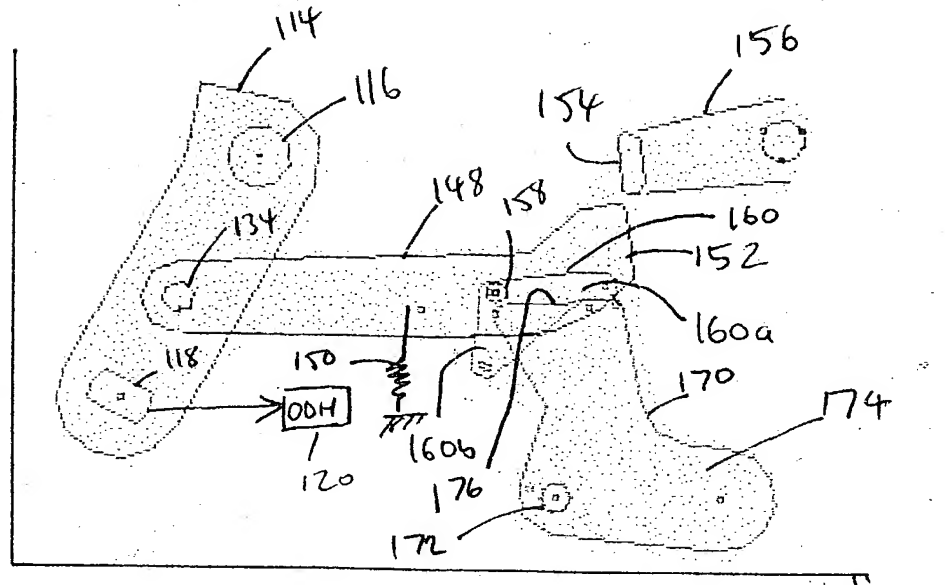

FIGURE 6 (REST POSITION)

110

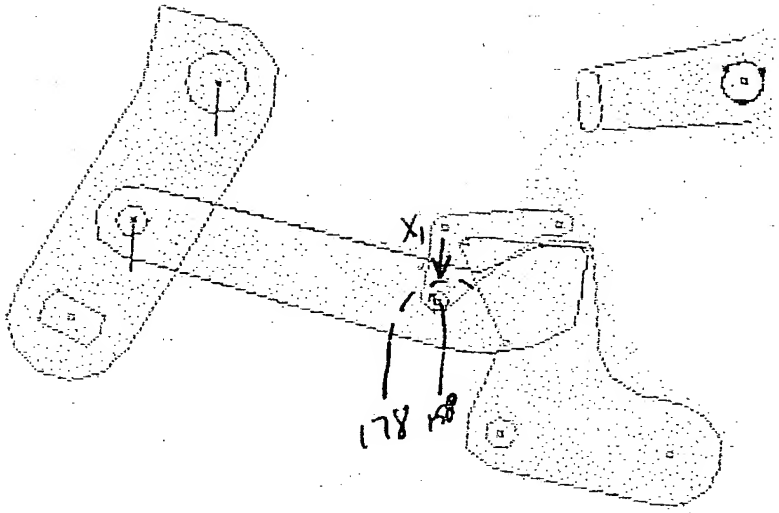

FIGURE 7 (LOCKED)

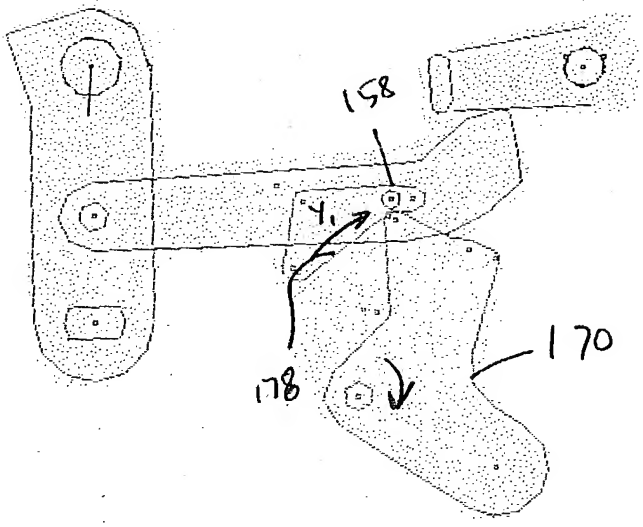

FIGURE 8 (RE-SETTING)

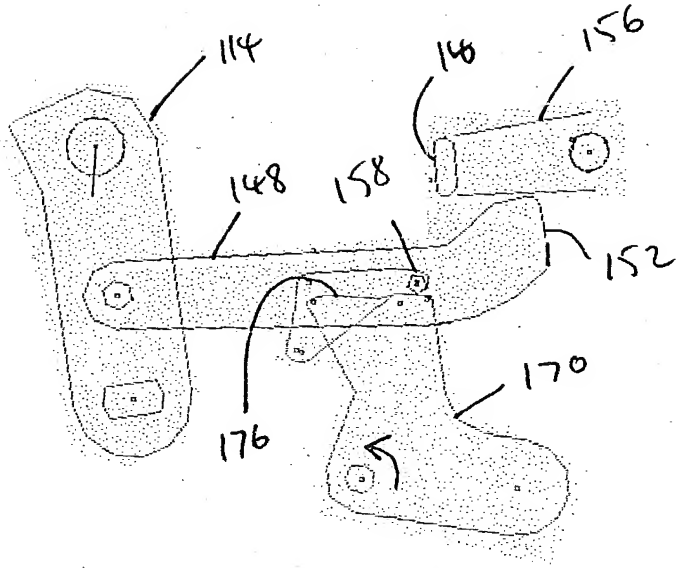

FIGURE 9 (FULL TRAVEL)

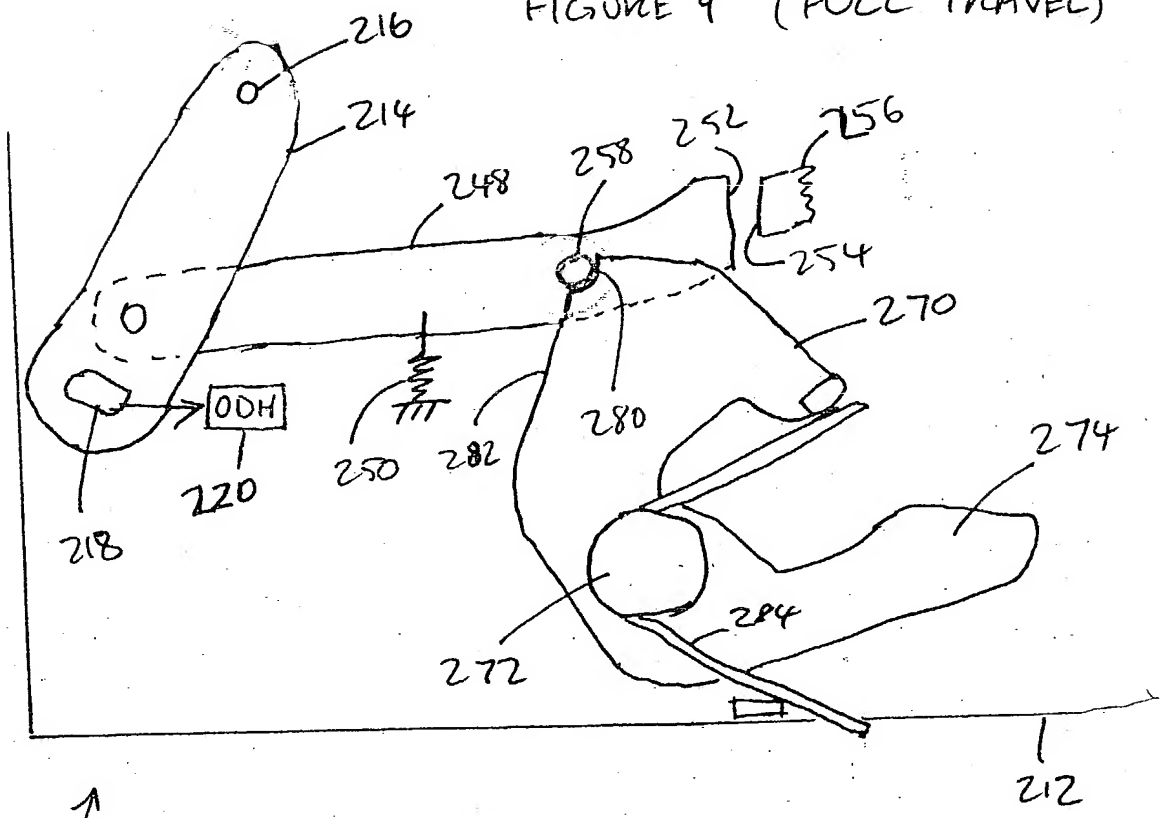

FIGURE 10 (REST POSITION)

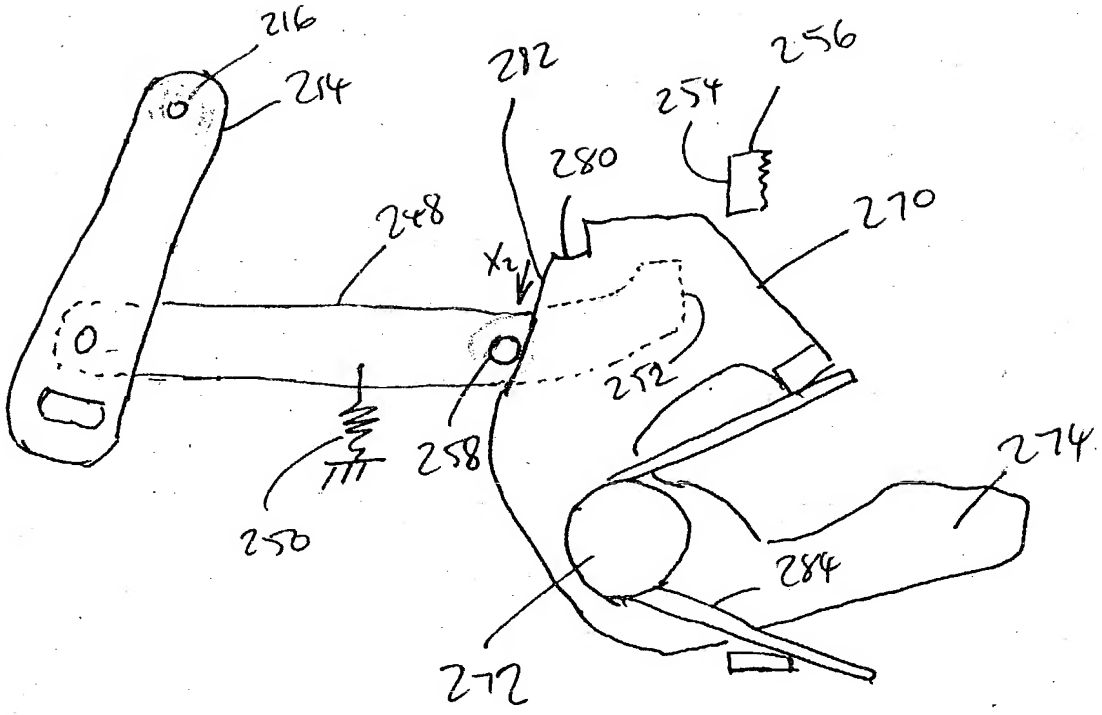

FIGURE 11 (LOCKED)